

- 1           1.     A purified nucleic acid construct comprising:  
2                 a gene cassette encoding at least one modified bioluminescent protein, said modified  
3     protein comprising at least one modification in its amino acid sequence relative to the sequence  
4     of an unmodified form of said protein, wherein said modification comprises the addition of a  
5     peptide sequence to the protein, said addition reducing a first duration of bioluminescence  
6     emitted by said modified bioluminescent protein relative to a second duration of  
7     bioluminescence emitted by said unmodified form of said protein.
- 1           2.     The purified nucleic acid construct of claim 1, wherein said gene cassette encodes  
2     a luciferase protein.
- 1           3.     The purified nucleic acid construct of claim 1, wherein said gene cassette encodes  
2     all proteins necessary for production of bioluminescence without addition of an exogenous  
3     substrate.
- 1           4.     The purified nucleic acid construct of claim 3, wherein said nucleic acid construct  
2     comprises a lux CDABE cassette.
- 1           5.     The purified nucleic acid construct of claim 2, wherein said luciferase protein  
2     comprises at least one a Lux protein selected from Lux A and Lux B.

1           6.       The purified nucleic acid construct of claim 5, wherein said Lux protein  
2 comprises the amino acid sequence of a Lux protein isolated from bacteria selected from the  
3 group consisting of *Photorhabdus luminescens*, *Vibrio fischeri* and *Vibrio harveyi*.

1           7.       The purified nucleic acid construct of claim 1, wherein the modified form of said  
2 bioluminescent protein comprises a peptide sequence that specifically binds to a protein  
3 associated with a proteolytic pathway.

1           8.       The purified nucleic acid construct of claim 7, wherein said protein associated  
2 with a proteolytic pathway is a tail-specific protease.

1           9.       The purified nucleic acid construct of claim 8, wherein the peptide sequence of  
2 the modified bioluminescent protein comprises SEQ ID NO:8.

1           10.      The purified nucleic acid construct of claim 8, wherein the peptide sequence of  
2 the modified bioluminescent protein comprises SEQ ID NO:9.

1           11.      The purified nucleic acid construct of claim 8, wherein the peptide sequence of  
2 the modified bioluminescent protein comprises SEQ ID NO:10.

1           12.      The purified nucleic acid construct of claim 9, wherein the modified protein is at  
2 least one of LuxA or LuxB.

1           13.     The purified nucleic acid construct of claim 10, wherein the modified protein is at  
2     least one of Lux A or Lux B.

1           14.     The purified nucleic acid construct of claim 11, wherein the modified protein is at  
2     least one of Lux A or Lux B.

1           15.     The purified nucleic acid construct of claim 7, wherein said protein associated  
2     with a proteolytic pathway mediates degradation of said modified bioluminescent protein via a  
3     ubiquitin-proteasome pathway.

1           16.     The purified nucleic acid construct of claim 15, wherein said protein associated  
2     with a ubiquitin-proteasome pathway is SCF(Grr1).

1           17.     The purified nucleic acid construct of claim 15, wherein the peptide sequence of  
2     said modified bioluminescent protein comprises a PEST-rich sequence.

1           18.     The purified nucleic acid construct of claim 17, wherein said PEST-rich sequence  
2     comprises a PEST-rich carboxy terminus of G1 cyclin (*Cln2*).

1           19.     A vector comprising a purified nucleic acid construct comprising a gene cassette  
2     encoding at least one modified bioluminescent protein, said modified protein comprising at least  
3     one modification in its amino acid sequence relative to the sequence of an unmodified form of  
4     said protein, said addition reducing a first duration of bioluminescence emitted by said modified

5 bioluminescent protein relative to a second duration of bioluminescence emitted by said  
6 unmodified form of said protein.

1 20. The vector of claim 19, wherein said vector is a plasmid.

1 21. The vector of claim 19, wherein said vector is an expression vector suitable for  
2 driving expression in a cell type selected from a bacterial cell, a yeast cell and a mammalian cell.

1 22. A prokaryotic cell comprising the vector of claim 19.

1 23. The prokaryotic cell of claim 22, wherein said cell is a bacterial cell.

1 24. The prokaryotic cell of claim 22, wherein said vector in said bacterial cell  
2 comprises the purified nucleic acid of claim 7 or 8.

1 25. A eukaryotic cell comprising the vector of claim 19.

1 26. The eukaryotic cell of claim 25, wherein said cell is a yeast cell or a mammalian  
2 cell.

1 27. The eukaryotic cell of claim 25, wherein said vector in said cell comprises the  
2 purified nucleic acid of claim 15.

1           28.    The purified nucleic acid of claim 1, wherein the duration of bioluminescence is  
2   determined by comparing a time course of a first measure of bioluminescence emitted by said  
3   modified protein and a time course of a second measure of bioluminescence emitted by said  
4   unmodified protein.

1           29.    The purified nucleic acid of claim 28, wherein said first measure is between about  
2   100-fold and 1000-fold lower than said second measure.